5.0 OVERVIEW OF INVESTIGATION PROCESS & DATA NEEDS ANALYSIS

The investigation process has been designed to collect data necessary to meet the following goals:

1. Estimate the nature and extent of sediment impacts.
2. Refine the conceptual model, especially to determine the upstream contributions to sediment impacts, and to define PCOIs.
3. Collect data necessary for completing the ecological and human health scoping and screening risk assessments.

The results of this investigation will be used to identify potential problem chemicals or areas within the Bonneville forebay, and make decisions for additional investigations. The identification of potential problem chemicals or areas will be based on the outcome of the future screening level risk assessments.

Supplementary investigations, if necessary, will focus on the collection of additional data to reduce uncertainty in screening level risk estimates. The data needs necessary to meet the above stated goals are discussed below.

The bulk of the investigation will be focused on collecting sediment samples within the two known source areas: the former in-water piles and the catch basin outfalls. Sampling will also occur in areas where hydraulic modeling by the USACE suggests sediment deposition may occur, and at Goose Island which was constructed with sediments removed from the south side of Bradford Island (Appendix A). The objectives for the analytical data collected are detailed in the SAP.

Each sediment sample will generally be analyzed for the same parameters: PCB Aroclors, metals, SVOCs, pesticides, butyltins, diesel and heavy oil range organics, TOC, and grain size.

Based on their sample type, URS has divided the sample locations into ten groups. Three of the groups are within the source area, two of the groups are potential depositional areas, one group is near Goose Island, one group addresses sediment transport into a Project structure, two groups address risk assessment data needs and the last group is a reference sample group (upstream). Table 5-1 summarizes the number of samples at each group and provides a summary of the rationale. Figure 5-1 depicts the planned sampling locations. The rationale for collecting samples within each group is provided in detail in Section 5.1.

Samples will be collected using a box core, grab sampler (e.g. Van Veen) or collected by a diver depending on the location. Figure 5-2 describes the process for choosing the sampling technique.

Previous sampling efforts have shown that standard sampling techniques do not work in the scour area near former Piles #1 and #2. Divers will be used to collect all the samples within this area.

Visual observation and hydraulic modeling has shown that more fine-grained sediments exist in the area downstream of former Pile #3, i.e. towards the spillway, and in other depositional zones. Therefore, in these areas, an attempt will be made to collect sediments with a box core. This method will allow subsurface sampling as well, if enough sediment is present. If the box core is unable to collect a sample, an attempt will be made using a grab sampler.

Although fine-grained material is not prevailing in the area of Piles #1 and #2, impacts have been detected. Due to that fact, if the grab sampler is also unsuccessful for any of the source area sampling points downstream of Pile #3, then a diver will be used to collect a surface sample. Divers will not be used to collect samples from non-source areas, since the observed lack of fine-grain sediments would suggest that these areas are not depositional and impacts are unlikely.

5.1 NATURE AND EXTENT

Impacted sediment has been detected at two areas at the site: the catch basin outfalls near the sandblast building on the north side of Bradford Island, and the former in-water debris piles on the north and east sides of the island. The sediment contamination at both locations may be attributed to both in-water and upland sources. Based on the existing conceptual model, the location of the former in-water debris piles is likely an erosional zone, and the area near the outfalls is more likely a depositional zone than erosional.

Other depositional zones exist within the forebay area and may receive sediments from either of the source areas. Biased and unbiased samples will be collected in the source areas to evaluate the extent of the impacts. Biased samples will be collected in areas where hydraulic modeling indicates that relative lower velocity exists.

In the area surrounding the former in-water debris piles, the vertical extent of sediment impacts will be defined based on the depth of the sediment retrieved by the diver. Subsurface samples will be attempted in areas that are anticipated to be depositional zones.

5.1.1 Source Area Groups

Historical sampling results indicates that contaminant impacts exist within the source areas. Additional samples are necessary to determine the extent of the impacts from those sources. One of the source area sample groups will be sampled using a biased approach, and the other groups will be sampled using a systematic grid to gain a better understanding of the extent of impacts.

Source Area: Temporal

Given the lack of fine-grained sediments within the former in-water debris piles, and elevated water velocities, sediments are scoured from this area. Four surface samples will be collected at existing sample locations to identify whether significant temporal changes exist within these areas. Two samples will be collected each from Pile #1 and Pile #2. In each pile, one sample will be collected where sediment removal occurred during the February waste removal effort,

and the second sample will be collected at the location within the pile that exhibited the highest PCB concentration. Sample locations are presented on Figure 5-1.

These samples will be collected with assistance from a diver and analyzed for PCBs, grain size and TOC, based on the previous analytical suite.

Source Area: Grid

Hydraulic modeling has indicated that flow directions within the source areas (former debris piles and catch basin outfalls) differ based on different times of the year, i.e. spill vs. no spill. Due to the changing flow directions, contaminated sediments from either source may be transported either upstream or downstream. Systematic grid sampling will be conducted within the area bounded by the two sources. Sample locations are presented on Figure 5-1.

The moderately tight grid spacing (25 feet by 75 feet) was selected to have a good coverage of this area and to allow a higher level of confidence in detecting areas of elevated sediment impacts. This spacing results in a total of 36 sample locations. Because the area downstream of Pile #3 may be depositional, up to 8 additional subsurface samples will be collected at grid points in possible depositional areas.

The samples will be collected using standard techniques or with assistance from a diver, as discussed above. Each sample will be analyzed for the full suite of parameters. Sample locations are presented on Figure 5-1.

Source Area: Transect

To estimate the lateral extent of impacted sediments surrounding the known source areas, two transects will be sampled at former in-water debris piles # 1 and #2 and adjacent to the catch basin outfalls. Due to the variability in flow direction, a transect will be placed both up and down stream of each source.

The transects will contain two samples each, 20 feet and 50 feet further off-shore of the grid sampling, for a total of 16 sample locations. Because the area downstream of Pile #3 may be depositional, an additional 6 subsurface samples will be attempted at transect points in possible depositional areas.

The samples will be collected using standard techniques or with assistance from a diver, as discussed above. Each sample will be analyzed for the full suite of parameters. Sample locations are presented on Figure 5-1.

5.1.2 Potential Depositional Groups

Sample locations within each of the potential depositional sample groups have been chosen based on the following factors:

- Bathemetry
- Relative lower velocity based on modeling

- Sediment grain size data
- Location relative to known source areas

Because these areas may receive sediment over multiple years, subsurface collection will be attempted. Sediments will not be collected if standard sampling is unsuccessful, since the absence of fine-grained material indicates that this is not a depositional area. Samples collected from these groups will be analyzed for the full suite of parameters.

Depositional

As discussed in the CSM (Section 4.0) the depositional areas can be divided into four main groups: the spillway forebay, the first powerhouse forebay, the second powerhouse forebay, and Goose Island.

The first powerhouse forebay consists of the following five depositional areas: the end sills of both navigation locks, the area where the powerhouse abuts the old navigation lock, the area between the navigation locks that is used as a small craft docking area, and downstream of the mouth of Eagle Creek.

A total of 13 surface and 13 subsurface samples will be attempted in depositional areas.

The southeast side of Bradford Island (located within the first powerhouse forebay) and the Goose Island area will be discussed as separate depositional areas due to their unique nature. Also discussed separately is the sediment removed from the western arm (B branch) of the fish ladder on Bradford Island. Water that supplies the B branch of the Fish Ladder is obtained from an area that has been modeled as depositional (where the spillway abuts Bradford Island).

Spillway Forebay-6 of the 13

During various hydraulic conditions, relative lower velocities are present in several locations in the spillway forebay. Modeling also has indicated that a counterclockwise eddy is present that may transport sediments from the source areas into these areas of lower velocities. Additionally, in the spillway forebay the riverbed is up to 40 feet lower in elevation than the crest of spillway (24 feet msl) and these areas may receive sediments over several years, depending on river flow.

six biased sample locations within the spillway forebay have been chosen to determine if impacted sediments have been transported to these areas of lower relative velocity. two of the six sample locations have been placed at the depositional area where the spillway abuts Bradford Island.

First Powerhouse Forebay-6 of the 13

The hydraulic modeling results have indicated that several potential depositional areas exist above the first powerhouse due to flow direction reversals and lower relative velocities. Six biased sample locations have been selected to determine if lower relative velocities has resulted in deposition of impacted fine grained sediments. Sample locations are presented on Figure 5-1 and discussed below.

- Two sample locations have been chosen at the upstream end sills of the navigation locks (one at each end sill).
- One sample is located in the area where the first powerhouse abuts the old navigation lock.
- Two sample locations are located along the southern shore of the island, downstream of the mouth of Eagle Creek.

Second Powerhouse Forebay-1 of the 13

One sample location has been chosen to evaluate the lower velocity area on the south shores of the river just upstream of the second powerhouse (left abutment).

Southeast Side of Bradford Island

Hydraulic modeling indicates that during no spill conditions, water flows upstream past the source area and continues around the eastern tip of Bradford Island into the first powerhouse forebay. This area was not modeled as a depositional zone, however the recent sampling results indicate that PCBs were detected in sediment on the south side of Bradford Island.

To evaluate the possible connection between impacted sediment at Pile #1 and the recent PCB detection, sampling will be attempted at 100-foot intervals starting at former Pile #1 and extending to the location of the PCB detection. One surface and one subsurface sample that exhibit depositional characteristics (i.e., higher percentages of fine-grained sediments) will be submitted for analysis. The locations where samples will be attempted are presented on Figure 5-1.

Goose Island

The sediments around Goose Island may be impacted from either transport from the source areas or due to the fact that the island was constructed from potentially impacted sediments on the south side of Bradford Island. Previous sediment and tissue sampling indicate that PCBs were detected in both media.

Three surface and three subsurface sediment samples will be collected offshore of Goose Island. Two surface soil samples (0-6") will be collected upland on Goose Island. Sample results will assist in the characterization of the extent of contamination from the possible source area. In addition, the results may establish whether Goose Island is a source of contamination due to the materials used for its construction. Sample locations are presented on Figure 5-1.

Fish Ladder Disposal Piles

The water intake for the eastern lateral of the fish ladder on Bradford Island is located where the dam abuts the island. This area has been modeled as a depositional area, therefore impacted sediment may have been transported into the fish ladder and deposited behind the baffles on the ladder. The sediment and other debris that collects behind the baffles are removed on a yearly basis in the winter, with the most recent removal being last year. The Bradford Island fish ladders are currently scheduled for maintenance between January 13 to February 13, 2003. The

removed material is generally placed in a staging area on the south side of Bradford Island as clean fill. A sample will be collected from the sediment removed from the fish ladder.

5.2 UPSTREAM CONTRIBUTION

Additional data are necessary to better understand the complex physical system in the forebay area, specifically in determining chemical distribution.

Recent upstream sampling results outside the eddy area caused by the dam and powerhouses appear to indicate that metals and SVOCs are present in the sediments entering the area.

The rationale for the selection of the upstream locations include:

- The locations should be upstream of, and unaffected by the known sources.
- The reference sample locations should define background or ambient concentrations of all PCOIs.
- The reference samples should exhibit similar sediment characteristics (i.e., total organic carbon and grain size) as site samples.

Two surface samples will be collected 500 feet upstream of the extent of the flow reversal in the forebay. Figure 5-1 depicts the sample locations.

5.3 RISK ASSESSMENT

Based on information obtained during previous site investigations, an assessment of the potentially complete and significant exposure pathways for ecological and human health receptors is warranted. The SAP discusses method reporting limits that will be used during this investigation that are planned to meet the risk assessment screening concentrations.

The risk assessments will be developed following this investigation and will utilize all existing data to assess risks to ecological receptors and human health. The future risk assessments will need to quantitatively assess impacts to aquatic receptors that were qualitatively assessed in the upland risk assessment.

A considerable amount of progress has been made in describing the potential human and ecological receptors and potentially complete exposure pathways in the upland risk assessments. As such, additional investigation information is not needed to complete the scoping level risk assessments, although additional refinement of those pathways may be necessary, e.g subsistence fisherman. A description of habitat types, (e.g. rocky, sandy, etc…) will be recorded for each sample location during this investigation and will also assist in the ecological scoping level risk assessment.

Screening Level Risk Assessment Data Needs

The goal of the screening level risk assessment is to determine whether a complete exposure pathway is present between each chemical of interest and selected receptors and to estimate risks along complete pathways (Apitz, S.E., Kirtay, V.J. 2000).

The analytical chemistry results from the sediment characterization will be used to assess risks. To assist in the determination of how impacts in the sediment are transported to the surface water, the following physical parameters will be collected: pH, total suspended solids (TSS), dissolved organic carbon (DOC) and total hardness. A total of ten surface water samples will be collected from just above the riverbed.

To assist in the determination whether contaminants in the sediments are bioavailable to the potential receptors, a total of ten sediment samples will be collected in areas that are finer-grained. These samples will be analyzed for Acid Volatile Sulfides (AVS) and Simultaneously Extractable Metals (SEM), pH, and moisture content.